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Hodder Gibson is grateful for the use of the following:
Photo of an intempo iPod docking station © Intempo, Ultimate Products Ltd. (Model Paper 2 page 5);
Photo of a Dualit toaster © Dualit Ltd (Model Paper 2 page 6);
Photo of a Black & Decker DustBuster CHV1500 © Black & Decker (Model Paper 2 page 9).
Design and Manufacture

Duration — 1 hour and 30 minutes
Total marks — 60

SECTION 1 — 24 marks
Attempt ALL questions.

SECTION 2 — 36 marks
Attempt ALL questions.

Read every question carefully before you attempt it.
Write your answers clearly in the spaces provided, using blue or black ink.
Show all working and units where appropriate.
Before leaving the examination room you must give this booklet to the Invigilator.
If you do not, you may lose all the marks for this paper.
1. A bird box is shown below.

(a) The bird box was manufactured mainly from softwood.

(i) State the name of a suitable softwood that could have been used in the manufacture of the bird box.

(ii) Describe the environmental benefits of choosing softwood rather than hardwood.

(b) A peg has been fitted to the bird box as shown above.

(i) Describe, with reference to tools, the way the position of the peg would have been marked out in the workshop.

(ii) Describe a permanent method of joining the peg to the bird box.
(c) The corner of the bird box is shown below.

(i) State the name of two suitable joining techniques that could have been used at the corners of the bird box.  

(ii) Describe the way that one of the joints you have named above could be manufactured in the workshop using hand tools.  

The bird box has a 35mm diameter opening to allow birds to enter.

(iii) Describe, with reference to tools and equipment, the way that the 35mm hole could have been manufactured in the workshop.  

The bird box has been finished with clear varnish.

(d) Describe the benefits of using clear varnish to finish the surfaces of the bird box.
1. (continued)

(e) The roof of the bird box has been manufactured from plastic as shown below.

![Image of a bird box with a plastic roof]

Describe the properties of thermoplastic that make it suitable for the roof of the bird box.  

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

(f) Screws were used to join the plastic roof to the main body of the bird box. Describe an alternative method of joining the roof to the main body that would allow the bird box to be easily accessed for cleaning.  

__________________________________________________________________________

__________________________________________________________________________

Total marks 24
2. iPod docking stations are shown below.

Before producing a specification for an iPod docking station the designer would have researched various issues.

With reference to iPod docking stations:

State four design issues which would have been researched and explain why each of these design issues is important.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

3. Designers use a variety of different graphic techniques in order to communicate.

State two graphic techniques, which the designer could use to effectively communicate with:

(a) The client
________________________________________________________________________

(b) The manufacturer
________________________________________________________________________

(c) Other designers
________________________________________________________________________

Total marks 6
4. A toaster is shown below.

![Toaster Image]

The manufacturer wishes to carry out an evaluation of the toaster. Describe an evaluation activity that could be carried out for each of the following aspects of the toaster.

(Note: a different technique must be used for each aspect.)

(a) Ease of use

(b) Aesthetics

(c) Value for money

(d) The speed of toasting

Total marks 8
5. Children’s cutlery is shown below.

Explain why the designer would consider each of following areas during the designing of children’s cutlery.

(a) Ergonomics 1

(b) Safety 1

(c) Aesthetics 1

(d) Materials 1

Total marks 4
6. The computer desk shown below was supplied as a flat-pack.

(a) State **two advantages** to the **consumer** of flat-packed furniture.  

(b) State **two advantages** of using beech veneered chipboard for the computer desk rather than using solid beech.  

(c) Knock down fittings are often used in the construction of flat-packed furniture. 
   Explain the term “**knock down fittings**”.  

(d) Flat-packed furniture can be aimed at a particular market niche. 
   Explain the term “**market niche**” with reference to flat packed furniture.  

Total marks 7
7. A cordless vacuum cleaner is shown below.

Dust collector

Trigger

Nozzle attachments

Describe how the design of the cordless vacuum cleaner has been influenced by ergonomics.
SECTION 1

1. (a) (i) Pine
   (ii) It can be locally sourced and it comes from sustainable forests.

   (b) (i) The position of the peg would have been marked out by using a rule, pencil and try square. The rule would be used to measure along the edge of the piece of wood to the required dimension; this would be marked by the pencil. Then the try-square would be used with the pencil to mark lines at 90 degrees to the edge of the wood. This would then be measured and marked along to get the position of the peg.
   (ii) The peg would be joined to the box using PVA glue and a blind hole. The hole would be drilled using a hand drill or pillar drill.

   (c) (i) Lap joint, dovetail joint
   (ii) **Lap joint:** after marking out the joint with a try square, marking gauge and rule, you would cut down halfway through the wood with a tenon saw. Then you would chisel out the waste wood with a bevel edged chisel. Finally you could use a hand router to smooth the bottom of the lap joint.
   (iii) **35mm hole:** after marking out with a rule and a try square, you would fit a forstener bit or flat bit to the pillar drill. You would then drill slowly through the wood to make sure you don’t split it at the back.

   (d) Varnish makes the box look good and it also makes it more durable and helps to protect the wood from rain and other weather conditions.

   (e) Thermoplastic can be worked with and easily cut to size. It is also available in colours, such as green, which look good in an outdoors environment. It is also weatherproof and will not rot or fade in the outdoors.

   (f) A wooden insert could be fitted to the inside of the roof which fits tightly into the internal space of the box. This would allow the roof to be lifted off easily and would add to the weight of the thermoplastic so it did not blow away.

SECTION 2

2. The designer would research: **Function, ergonomics, durability and safety.**
   - **Function:** Function is important because the designer needs to find out what the docking station could do. Such as volume and tone settings for the music.
   - **Ergonomics:** The buttons need to be easily pressed and fit human hand sizes.
   - **Durability:** The materials used to make the docking station should withstand regular use, such as buttons or controls.
   - **Safety:** The connections to the power source should be safe and not endanger the user from electric shock.

   *One mark for the four issues, and one mark for each explanation.*

3. (a) **The client:** Presentation drawing, pictorial drawings
   (b) **The manufacturer:** Orthographic drawing, exploded view
   (c) **Other designers:** Initial sketches, developed design details
4. (a) Ease of use: User trial – toast a piece of bread and describe how easy it was to use the toaster.
(b) Aesthetics: Survey – ask a group of people if they like the colour used in the design of the toaster.
(c) Value for money: Comparison to other products – compare the price of other products that do the same job and see if the toaster is a reasonable selling price.
(d) Speed of toasting: Testing – time the toaster to see how long it takes to toast the bread and compare to other toasters.

5. (a) Ergonomics: Any relevant and true anthropometric, psychological or physiological explanation.
(b) Safety: Sharpness/bluntness/build quality/hygiene/weight/etc.
(c) Aesthetics: Shape/size/form/contrast/colour/encourage usage/etc.
(d) Materials: Comfortable/tactile/attractive or in-built colour/hygiene/safety/ease of cleaning/lightweight/non-allergenic/etc.

6. (a) • Instant purchase
   • Easy to assemble
   • No delivery waiting
   • Low cost
   • Satisfaction of building
   • Easy to transport
   • Easy to store prior to assembly
   • Disassembly option, when not in use
   • Access to difficult property areas, such as up narrow staircases

   (b) • Low cost
   • Environmental reasons
   • Uniformity of thickness
   • Smooth surfaces
   • Easy to machine
   • Wide flat boards
   • Knock Down Fittings are compatible
   • Uses materials that might be considered as waste

   (c) • Special fittings to join furniture parts together
   • Mechanical fixing using standard components

   (d) A market niche is a particular group of people that a product could be aimed towards. Flat pack furniture is low cost and has a limited life span. Young families with less income would be the ideal market niche for flat pack furniture.

7. Candidates have three possible routes to go down in their response: anthropometrics, physiology and psychology.

There is no requirement to refer to any of these areas by name. Typical responses within each aspect are shown below. Six suitable responses will gain six marks.

Any suitable answer relating human dimensions and relevant aspect of the vacuum cleaner should be awarded one mark, e.g. the handle length has been designed to suit adult male 95th percentile palm width.

Other suitable answers:
• Trigger size – fingertip width
• Gap between handle and main body – adult hand thickness